

# *Haplochromis vonlinnei* spec. nov., a piscivorous haplochromine cichlid (Teleostei, Perciformes) from the Mwanza Gulf area of Lake Victoria, Tanzania

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A new species of haplochromine cichlid from Lake Victoria, only known from the Mwanza Gulf area is described.

## Introduction

In the first edition of the *Systema Naturae*, which appeared in Leiden as three large single-page tables, Linnaeus (1735) for his account of the fishes relied on the research carried out by his friend Petrus Artedi (Pietsch, 1995).

Linnaeus obtained Artedi's manuscripts from his landlord after Artedi had drowned in a canal in Amsterdam. Three years later, after spending much time in revising and completing the original manuscript, Linnaeus had it published in Leiden (Artedi, 1738). In the introduction of this work Linnaeus gives an account of his co-operation with Artedi. The following sentences deal with their competition for ichthyology [translated]:

"Various subjects of natural history we started to study together, until one of us saw that he had been defeated by the other. Then that one immediately stopped with this study and recognized the other as his master in this subject.

Both of us strived for the victory in ichthyology, until after a prolonged effort I had to admit myself beaten; from then on I have left this study entirely up to him, just like the knowledge of the amphibians. On the other hand he readily recognized me as the leading man for the knowledge of birds and insects...".

It was not until the tenth edition of the *Systema Naturae* that Linnaeus fixed his own name in fish taxonomy when he published a new classification of fishes. The total number of fish species recognized by Linnaeus in his *Systema Naturae* is 414 (Pietsch, 1995: 102). This number is lower than the total number of species of haplochromine cichlids estimated to be present in Lake Victoria before the upsurge of the Nile perch (e.g. Witte & van Oijen, 1995; Witte et al., 2007).

In the tenth edition of the *Systema Naturae* the Nile Perch, *Lates niloticus* (Linnaeus, 1758) was included as *Labrus niloticus*, and the only cichlid, the Nile Tilapia, was included under the name *Perca nilotica* (now valid as *Oreochromis niloticus* (Linnaeus, 1758)). Both species were introduced into Lake Victoria in the 20<sup>th</sup> century.

Eschmeyer (1998), in his Catalogue of Fishes, lists 26 fish species named after Linnaeus in recognition for his significance for (fish) taxonomy. Two species bear the species group name "*linnaei*" and 24 are named "*linnei*". Regrettably, only one of these 26 nominal taxa is considered a valid species. On the other hand, four of the eight species named after Artedi are considered valid. Therefore, it seemed appropriate to name a new fish species after Linnaeus at the occasion of the 250<sup>th</sup> anniversary of the official start of zoological nomenclature.

## Methods

The specimens were all caught in a bottom trawl net with a 25 m head rope and a codend mesh size of 19 mm of the MV Mdiria, a 14.8 m long, 120 hp trawler of the Freshwater Fisheries Institute Nyegezi. On the basis of collections made before the explosive increase of the Nile perch in the Mwanza Gulf (van Oijen et al., 1981; Witte et al., 1992a, b) the piscivores, with an estimated number of ca 100 species, were considered the most speciose trophic group (Witte & van Oijen, 1995). Piscivores were found in all habitats and exhibited the largest variety in size. Standard lengths of adult specimens varied between 76 and 260 mm SL (van Oijen, 1982).

Terminology and measurements follow Barel et al. (1976, 1977), Hoogerhoud & Witte (1981), Witte & Witte-Maas (1981) and van Oijen (1991).

Arguments for placing the new species in the genus *Haplochromis* are given in van Oijen (1996).

All drawings and photographs, except fig. 1, were made by the first author.

## Description

### *Haplochromis vonlinnei* spec. nov (figs 1-10, tables 1-2)

Material.— Holotype, ♂, 159.0 mm, RMNH 83843, Mwanza Gulf, Tanzania, Lake Victoria, 20.iv.1979, HEST.— Paratypes: All paratypes were collected by the Haplochromis Ecology Survey Team in the Mwanza Gulf, Tanzania, Lake Victoria: 1 ♀, 135.8 mm, RMNH 73787, 19.v.1978; 1 ♂, 143.2 mm, RMNH 83844, 20.iv.1979; 1 ♀, 115.1 mm, RMNH 83845, 20.iv.1979; 1 ♂, 157.0 mm, RMNH 83846, 23.iv.1980.

Description based on 5 specimens 115.1-159.0 mm SL, measurements were taken from all specimens. Digital colour pictures are available for all type specimens.

Specimens RMNH 73787, RMNH 83844 and RMNH 83846 were dissected to make skeletal preparations of the right upper and lower jaws. Moreover, the first gill arch on the right side was removed from RMNH 83846.

Etymology.— This species is named after the contriver of modern biological nomenclature Carl von Linné.

Diagnosis.— A moderately large sized, moderately slender macrognathic species with a smoothly curved dorsal head profile, a rather acute snout, and strongly curved teeth. The species has a distinct mid-lateral band, which is broader in males than in females, a thinner and interrupted dorsal lateral band. A ripening male had the snout and cheek brownish grey, the gill cover and the rostral part of the flank golden brown, and the ventral side, belly, caudo-ventral part of the flank and the caudal peduncle blackish.



Fig. 1. *Haplochromis vonlinnei* spec. nov. Holotype, RMNH 83843, ♂, 159.0 mm SL.

**Resembling species.**— Amongst the described macrognathic haplochromine species of Lake Victoria with strongly curved oral teeth (see van Oijen, 1991) the only one that compares to *H. vonlinnei* in body shape is *H. pyrrhopteryx* van Oijen, 1991. However, the live and preserved colouration of this species differs markedly. Among other things, both sexes of *H. pyrrhopteryx* have a black chest belly and ventral side whereas a mid-lateral band is missing. Another species that has a comparable body shape, *H. altigenis* Regan, 1922, differs by a more prominent premaxillary pedicel, a relatively much deeper cheek and less strongly curved oral teeth. Live colours of this species are unknown (Greenwood, 1967).

**Habitus.**— Body moderately slender and moderately compressed. Dorsal head profile smoothly curved with a slight bend at the tip of the premaxillary pedicel. Snout relatively acute. Cephalic line openings not enlarged, lateral line canals on lachrymal not visible. Eye and pupil circular. Mouth slightly oblique. Lips slightly broadened. Premaxilla not expanded medially. Exposed part of maxilla non bullate, the posterior tip reaching or just passing the vertical through the anterior eye margin. Lower jaw isognathous or slightly prognathous, slightly protruding. Rostral outline of lower jaw convex, mental area rounded. No mental prominence. Lateral sides of lower jaw oblique.

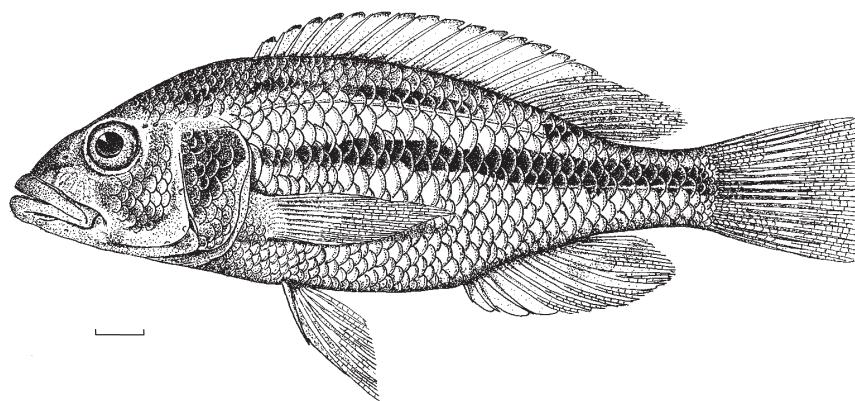


Fig. 2. *Haplochromis vonlinnei* spec. nov. RMNH 83844, ♂, scale equals 10 mm.

**Scales.**—Scales on head and rostral part of dorsum cycloid. Chest scales cycloid or slightly ctenoid laterally, cycloid ventrally. Scales on remaining parts of body ctenoid. Proximal two-thirds of caudal fin covered with small elongated, ctenoid scales. No scale sheath at the base of dorsal and anal fins.

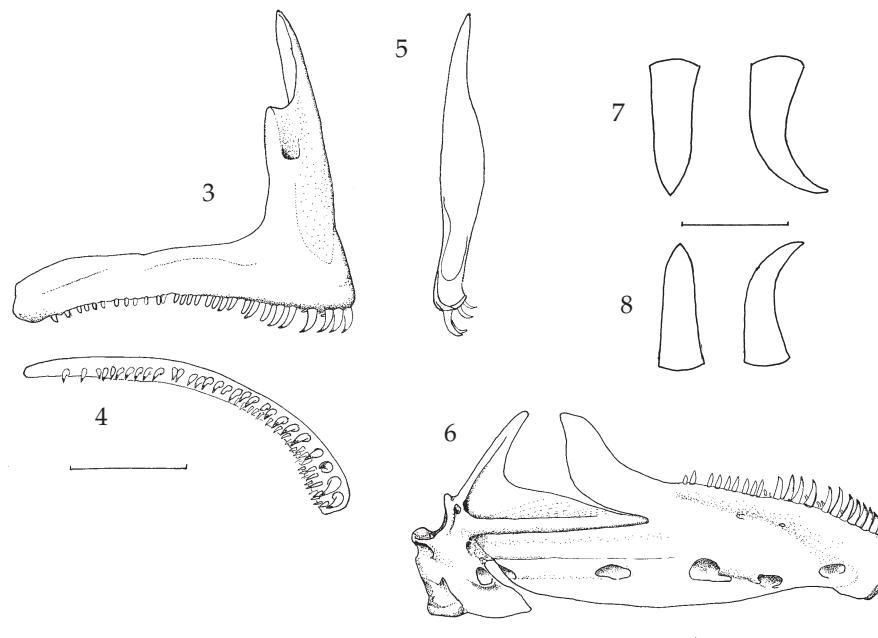
**Fins.**—In the holotype, a ripening male, the caudal-most points of the dorsal and anal fin reach the base of the caudal fin, and the pectoral and pelvic fins reach beyond the rostral-most point of the anal fin. In all other (smaller) specimens the dorsal and anal fins do not reach the base of the caudal fin, and pectoral and pelvic fins do not reach the anal fin origin.

**Gills.**—There are nine gill rakers on the lower part of the first gill arch. The lowermost four reduced, cone shaped, the uppermost three short with expanded heads, the remaining ones short with simple heads. Approximately 130 gill filaments on the lateral hemibranch of the first gill arch (in RMNH 83846).

**Viscera.**—Intestine length varies from 0.9-1.2 times SL ( $n = 5$ ). Following the definitions of Zihler (1982) the arrangement of the digestive tracks of adult *H. vonlinnei* is of Type D (with backflap).

**Oral teeth.**—Descriptions are based on examination of all specimens.

**Shape.**—Teeth in the outer row moderately stout, conical and moderately acutely pointed unicuspids. Premaxillary teeth strongly curved; as a consequence, apart from the most anterior placed ones, the premaxillary teeth are hardly visible. Lower jaw teeth



Figs 3-8. *Haplochromis vonlinnei* spec. nov., RMNH 73787. Fig. 3. Right premaxilla, lateral view. Fig. 4. Right premaxilla, perpendicular view of dentigerous arm. Fig. 5. Right premaxilla, medial view of ascending arm. Fig. 6. Right lower jaw, lateral view. Fig. 7. Fifth outer row tooth of premaxilla, labial and lateral view. Fig. 8. Fifth outer row tooth of lower jaw, labial and lateral view. Scale of bony elements = 5 mm, scale of teeth = 1 mm.

moderately curved. Inner row teeth are smaller replica's of the outer row teeth. In both jaws the inner row teeth are strongly curved.

Dental arcade and tooth band. Dental arcade rounded in both jaws. Two inner rows in the lower jaw, two to three in the upper jaw. Distance between outer row and first inner row slightly larger than distance between the inner rows.

Counts and setting. 29-35 teeth in the outer row of the upper jaw, 22-25 in the lower jaw. Outer teeth regularly set at a distance equal to slightly larger than the diameter of the tooth base.

Implantation. Outer row teeth in upper jaw recumbent. Outer row teeth in lower jaw, rostrally erect to slightly procumbent, laterally recumbent. All inner row teeth are strongly recumbent.

Osteology.—The osteological descriptions are based on the skeletal elements of one specimen, RMNH 73787.

Table 1. *Haplochromis vonlinnei* spec. nov. Linear measurements (in mm).

		Holotype	Paratypes	Mean ± st. dev
Standard length		159.0	115.1-157.0	142.0 ± 16.0
Body depth	%SL	32.7	30.8-33.1	32.1 ± 1.0
Caudal peduncle Length	%SL	16.3	16.3-17.3	16.74 ± 0.4
Caudal peduncle Depth	%SL	11.5	11.0-11.5	11.3 ± 0.2
Caudal peduncle D/L		0.7	0.6-0.7	0.7 ± 0.0
Head length	%SL	35.0	34.9-35.6	35.3 ± 0.3
Snout length	%HL	35.9	33.3-37.4	35.3 ± 1.4
Head width	%HL	44.7	42.1-45.2	44.1 ± 1.2
Interorbital width	%HL	25.0	22.2-24.1	23.6 ± 1.0
Preorbital width	%HL	27.3	26.5-27.7	27.0 ± 0.5
Lachrymal width	%HL	26.6	25.5-27.2	26.6 ± 0.6
Preorbital depth	%HL	19.6	18.3-19.5	19.0 ± 0.6
Eye length	%HL	19.8	20.1-22.4	20.9 ± 1.0
Cheek depth	%HL	23.3	22.4-24.5	23.4 ± 0.7
Lower jaw length	%HL	50.3	45.9-49.3	48.1 ± 1.6
Lower jaw width	%HL	23.0	21.3-25.6	23.8 ± 1.7
Upper jaw length	%HL	40.9	38.0-39.2	39.0 ± 1.1
Prem. pedicel length	%HL	26.9	26.5-27.6	27.2 ± 0.4

Table 2. *Haplochromis vonlinnei* spec. nov. Qualitative measurements.

Dorsal head profile curvature	Slightly curved
Premaxillary pedicel prominence	Hardly visible to slightly prominent
Lower jaw anterior extension	Moderately protruding
Lateral snout outline	Prognathous
Mental prominence	Hardly visible
Lip thickening	Not thickened
Premaxilla beaked	Not beaked
Premaxilla expanded	Somewhat expanded
Maxillary posterior extension	Through the iris
Cheek vertical scale rows	5 or 6



Fig. 9. *Haplochromis vonlinnei* spec. nov. RMNH 83844, a quiescent male, 143.2 mm SL.



Fig. 10. *Haplochromis vonlinnei* spec. nov. Holotype, RMNH 83843, a ripening male, 159.0 mm SL.



Fig. 11. *Haplochromis vonlinnei* spec. nov., RMNH 83845, a maturing female, 115.1 mm SL.

Oral jaws.— Premaxilla; dentigerous arm longer than ascending arm. Angle between the arms 80°. Both arms relatively broad. Ventral outline of dentigerous arm slightly concave. Mandible relatively stout. Length/depth ratio 2.4. The tooth bearing part is slightly less than half the jaw length.

Colouration.— Live colouration of males. A quiescent male had the upper lip, the dorsal part of the snout and the dorsal head surface dark grey. Ventral snout, rostral part of cheek and gill cover silvery, caudal part of cheek white. The black opercular blotch extended forward to the caudal margin of the eye. Lower lip whitish. Lower jaw, interopercular and preopercular pinkish. Iris dark blue, the thin inner ring golden yellow. Dorsum and dorsal part of caudal peduncle dark grey, a black dorsal lateral line runs beneath the dorsal fin just above the lateral line. Flank light yellow, caudal peduncle grey. The broad, black mid-lateral band begins at the operculum (rather indistinct on the first two scales) and continues to the base of the caudal fin. Branchiostegal membrane, chest, belly and ventral side white.

Fins.— Dorsal fin greyish with dark grey lappets and many dark grey-red streaks between the rays. Caudal fin greyish hyaline, medially with a black membrane, dorsally and caudally with dark streaks between the rays, the distal part ventrally bright red, dorsally grey with a red flush. Anal fin pink around the spines, the rayed part pinkish hyaline, except for the area around the three medium sized orange egg dummies which is darker grey. The anal fin has two to four rather large, bright orange egg dummies with a white inner ring and a hyaline outer ring. Pectorals hyaline, pelvics sooty laterally merging into hyaline medially.

A ripening male had the ground colour of the head grey. Lateral part of lower lip lighter, caudo-ventral corner of cheek and operculum whitish. Iris dark blue, the thin inner ring golden yellow. The black opercular blotch rostrally extended to the preoperculum. Dorsal part of upper lip and snout, dorsal head profile, dorsum and caudal peduncle dark grey. Ventral side, belly and caudal part of flank dark grey. Lateral part of chest whitish. Rostral part of flank lighter grey. Inner ring of eye golden yellow. A broad, black mid lateral band begins at the operculum and continues to the base of the caudal fin. A black dorsal lateral line runs beneath the dorsal fin just above the lateral line. Fins.— Dorsal fin greyish with black lappets. The caudal half of the fin with wide black streaks between the spines and rays merging into red spots on the rayed part. Caudal fin dark grey blue proximally, grey distally; medially with dark streaks between the rays, dorsally and ventrally with dark spots between the rays. Anal fin black on the proximal half, the distal half reddish rostrally, hyaline caudally. Three medium-sized orange egg dummies with a thin white rim on the caudal part of the black proximal half. Pectorals hyaline, pelvics dark grey to black.

Live colouration of females.— Lips, snout and the dorsal head surface brownish grey. Cheek and gill cover silvery white, the large, dark, opercular blotch broadly extended to the preoperculum and more indistinctly to the eye margin. Preopercular area pinkish yellow. Dorsal half of iris bluish grey, ventral half golden yellow. The dorsal half with a thin yellow inner ring. Branchiostegal membrane, chest and ventral side white. Dorsal part of flank and caudal peduncle grey with a yellow flush, ventral part light yellow. A distinct black mid lateral band from the operculum to the caudal fin base. On the darker dorsum the interrupted dorsal lateral band is less distinct.

**Fins.**— Dorsal fin yellowish grey with dark lappets and grey streaks between the rays. Caudal fin dark grey proximally, the distal part hyaline greyish with a yellow flush. Anal fin transparent yellowish, with 2 darker yellow spots caudally on the proximal part. Pectorals hyaline, pelvics white.

**Preserved colouration.**— The ripening male: Head and body brownish, lower lip, interorbital area and area between dorsal lateral band and mid lateral band lighter ivory-brown. Snout and lateral sides of lower jaw sooty. Dorsal half of gill cover blackish. Body with a broad, irregularly shaped mid lateral band running from gill cover to caudal fin base and a thinner and much less distinct dorsal lateral band. There are traces of six vertical bars which are more distinct in the light area between the lateral bands and on the rostral part of the flank. The ventral half of flank and caudal peduncle are dark brown to sooty caudally. Dorsal fin dark hyaline, darker proximally with dark grey lappets. Pectorals hyaline. Pelvics black. Anal fin hyaline, but sooty proximally and rostrally, with three dark rimmed, ivory egg dummies. Caudal fin dark hyaline, rays brownish, darker streaks and spots between the rays.

**Preserved colouration of females.**— Head and body brownish, upper lip, snout, post orbital area, and dorsal parts of head and body darker. Opercular blotch almost black. Body with a black, complete mid lateral band and an incomplete dorsal lateral band. All fins hyaline. Lappets of dorsal fin dark. On the base of the caudal fin the mid lateral band is continued, the membranes between the three medial fin rays are also black.

**Distribution.**— *Haplochromis vonlinnei* is only known from Lake Victoria

**Ecology.**— All specimens were caught in bottom trawls made in the Mwanza Gulf in the sublittoral area between Nyegezi Bay, Ngoma Bay, the shore west of Hippo Island and the Rocky islands. These trawls were all made over a bottom of organic mud with a depth of 5.5 to 18 m.

**Habitat.**— Presumably *H. vonlinnei* is a demersal species.

**Food.**— Stomachs and/or guts of all specimens contained remains of small haplochromine cichlids. Only in two of the five specimens (RMNH 83844 and RMNH 83843) the prey length could be estimated. They were found to measure approximately 30 and 37 mm SL respectively.

**Breeding and growth.**— All type specimens of this species are adult. No information is available on the breeding behaviour of this species.

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## References

- Artedi, P. 1738. *Ichthyologia, sive Opera omnia piscibus scilicet: Bibliotheca ichthyologica. Philosophia ichthyologica. Genera piscium. Synonymia specierum. Descriptiones specierum. Omnia in hoc genere perfectiora, quam antea ulla. Post huma vindicavit, recognovit, coaptavit et edidit Carolus Linnaeus, Med. Doct. Et Ac. Imper. N.C. Leiden: Wishoff.*
- Barel, C.D.N., F. Witte & M.J.P. van Oijen, 1976. The shape of the skeletal elements in the head of a generalized *Haplochromis* species: *H. elegans* Trewavas 1933 (Pisces, Cichlidae).— Netherlands Journal of Zoology 26: 163-265.
- Barel, C.D.N., M.J.P. van Oijen, F. Witte & E.L.M. Witte-Maas, 1977. An introduction to the taxonomy and morphology of the haplochromine cichlids from Lake Victoria.— Netherlands Journal of Zoology 27: 333-389.
- Eschmeyer, W.N. (ed.), 1998. *Catalogue of Fishes, Vol. I. Introductory Materials. Species of Fishes (A-L).* Special Publication No. 1. California Academy of Sciences, California. Pp 1-958.
- Greenwood, P.H., 1967. A revision of the Lake Victoria *Haplochromis* species (Pisces, Cichlidae), Part VI.— Bulletin British Museum of natural History (Zoology), 15 (2): 29-119.
- Hoogerhoud, R.J.C. & F. Witte, 1981. Revision of species from the "*Haplochromis* " empodisma group.— Netherlands Journal of Zoology 31: 232-273.
- Linnaeus, C., 1735. *Systema naturae, sive regna tria naturae systematicae proposita per classes, ordines, generes et species.* Leiden. Theodoor Haak.
- Linnaeus, C., 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I. Editio decima, reformata.*— pp. [1-4], 1-824. Holmiæ. (Laurentii Salvii).
- Oijen, M.J.P. van, F. Witte & E.L.M. Witte-Maas, 1981. An introduction to ecological and taxonomic investigations on the haplochromine cichlids from the Mwanza Gulf of lake Victoria.— Netherlands Journal of Zoology 31: 149-174.
- Oijen, M.J.P. van, 1982. Ecological differentiation among the piscivorous haplochromine cichlids of Lake Victoria.— Netherlands Journal of Zoology 32: 336-363.
- Oijen, M.J.P. van, 1991. A systematic revision of the piscivorous haplochromine Cichlidae (Pisces: Teleostei) of Lake Victoria (East Africa). Part 1.— Zoologische Verhandelingen Leiden 272: 1-95.
- Oijen, M.J.P. van, 1996. The generic classification of the haplochromine cichlids of Lake Victoria, East Africa.— Zoologische Verhandelingen Leiden 302: 57-110.
- Pietsch, Th.W. (ed), 1995. Historical portrait of the progress of Ichthyology from its origin to our own time, by Georges Cuvier. Johns Hopkins University Press. Baltimore and London. 1-xiii,1-366.
- Witte, F. & M.J.P. van Oijen, 1995. Biology of haplochromine trophic groups: 321-335. In: F. Witte & W.L.T. van Densen (eds). Fish stocks and fisheries of Lake Victoria. A handbook for field observations.— Cardigan, Dyfed, U.K.
- Witte, F., T. Goldschmidt, J. Wanink, M. van Oijen, K. Goudswaard, E. Witte-Maas & N. Bouton, 1992. The destruction of an endemic species flock: quantitative data on the decline of the haplochromine cichlids of Lake Victoria.— Environmental Biology of Fishes 34: 1-28.
- Witte, F., T. Goldschmidt, P.C. Goudswaard, W. Ligtvoet, M.J.P. van Oijen & J.H. Wanink, 1992. Species extinction and concomitant ecological changes in Lake Victoria.— Netherlands Journal of Zoology 42: 214-232.
- Witte, F. & E.L.M. Witte-Maas, 1981. Haplochromine cleaner fishes: a taxonomic and eco-morphological description of two new species.— Netherlands Journal of Zoology 31: 203-231.
- Witte, F., J.H. Wanink & M. Kishe-Machumbu, 2007. Species distinction and the Biodiversity Crisis in Lake Victoria.— Transactions of the American Fisheries Society 136: 1146-1159.
- Zihler, F., 1982. Gross morphology and configuration of the digestive tract of Cichlidae (Teleostei, Perciformes): phylogenetic and functional significance.— Netherlands Journal of Zoology 32: 544-571.

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